AWT MULTI-PHASE SURFACTANT TECHNOLOGY SURFACTANT STUDY - PAINTS AND COATINGS

Advanced Wetting Technologies Pty Ltd

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Introduction

Advanced Wetting Technology formulations have been trialed by Australia's largest paint manufacturer with various alkyd/acrylic aqueous resins/binders and the following pages detail the comprehensive testing and analysis undertaken to demonstrate the technology's comparative effectiveness.

The reason for the trial was that this company now considers fluorinated surfactants such as Zonyl "chemicals of concern" to be eliminated as soon as possible in aqueous and non-aqueous systems over their complete range of paints and coatings.

AWT formulations were found to be superior in terms of spreading and levelling to all other surfactants types trialled, including fluoros, silicone and other advanced technology non-ionic formulations from BASF, Dow, Sinochem and other major companies.

This is highly significant as paints once applied must immediately level before paint cures forming a skin in order to get the desired surface smoothness. It also enables far more efficient and cost effective and non-toxic applications of paints and coatings.

There were 790 individual measurements taken so it can be said with confidence that the estimate of standard error was precise, with 770 degrees of freedom for error. The data were pooled over all of the binders as well as data analysed by surfactant vs individual binder.

All of the experimental work was done by Australia's largest paint manufacturer now owned by a multi-national company. AWT's only involvement was to supply samples which were unidentified formulations.

This company has committed to use AWT formulations over their range of products by the end of first quarter next year.

Since this work AWT has developed even more effective multi-phase formulations.

All of the AWT formulations used in the trials are environmentally friendly and non-toxic (unlike fluoros, silicones and Teric BL9 which is an aquatic toxin.

Materials and Methods Supplied by Paint Company

Surfactant Evaluation – Compatibility and Drop Test Method

SAFETY WARNING: REFER TO PRODUCT SAFETY DATA SHEETS FOR INFORMATION CONCERNING PRODUCTS TO BE USED WITH THIS SPECIFICATION. FOLLOW SAFE WORKING PRACTICES. REFER SUPERVISOR.

1. **PURPOSE**
   To evaluate surfactant compatibility with resin.

2. **PRINCIPLE**
   The surfactant compatibility with a resin is determined by its ability to be homogenous and have good surface wettability on substrate.

3. **SCOPE**
   This test method is to cull the amount of surfactant required for further testing.

4. **APPARATUS**
   - Glass vial
   - Form P121-10N Leneta (black) Chart
   - Micropipette
   - Pipette tips
   - Vernier Calliper

5. **PROCEDURE**

Mixture preparation

- Make a resin mixture in 100mL glass vial.
- Add 1% of surfactant according to resin mass.
  - For example: 80g of resin + 0.8g of surfactant.
- Invert the glass vial 10 times.
- After 24 hours, make visual observation such homogeneous, separation, change in colour, cloudiness, milkiness – compatibility or incompatibility.
- Resin mixtures that were compatible should be further tested using the Drop Test Method.

Conditioning the micropipette

- Ensure the dial is on desire amount.
  - Set dial of micropipette to 0.5mL (050).
- The micropipette is held vertically, pre-wet the pipette tip by immersing into liquid, half way of the vessel.
- Inaccuracy doubles when immersing the tip too deeply.
- Inaccuracy increases three to five times by immersing too deeply while holding the pipette at a 30-40° angle.

- Press the plunger button to allow water to aspirate and remove the pipette straight from vessel and dispense the liquid by pressing the plunger button a couple of times before testing.

Drop Test Method

- Clean the Leneta (black) chart using ethanol. Ensure the chart is free from dirt and grease.
- Collect the liquid and slowly dispense onto the Leneta chart.
  - Do not dispense the rest of the liquid.
- Measure the droplet spreading using the Vernier calliper immediately.
- Repeat 10 times.

Analysis

- Use ANOVA (Analysis of Variance) to analyse data, to aid with selection of "best" surfactant
- Refer to Work Instruction.
- The best Resin mixture should be further tested for contact angle using the Goniometer instrument.

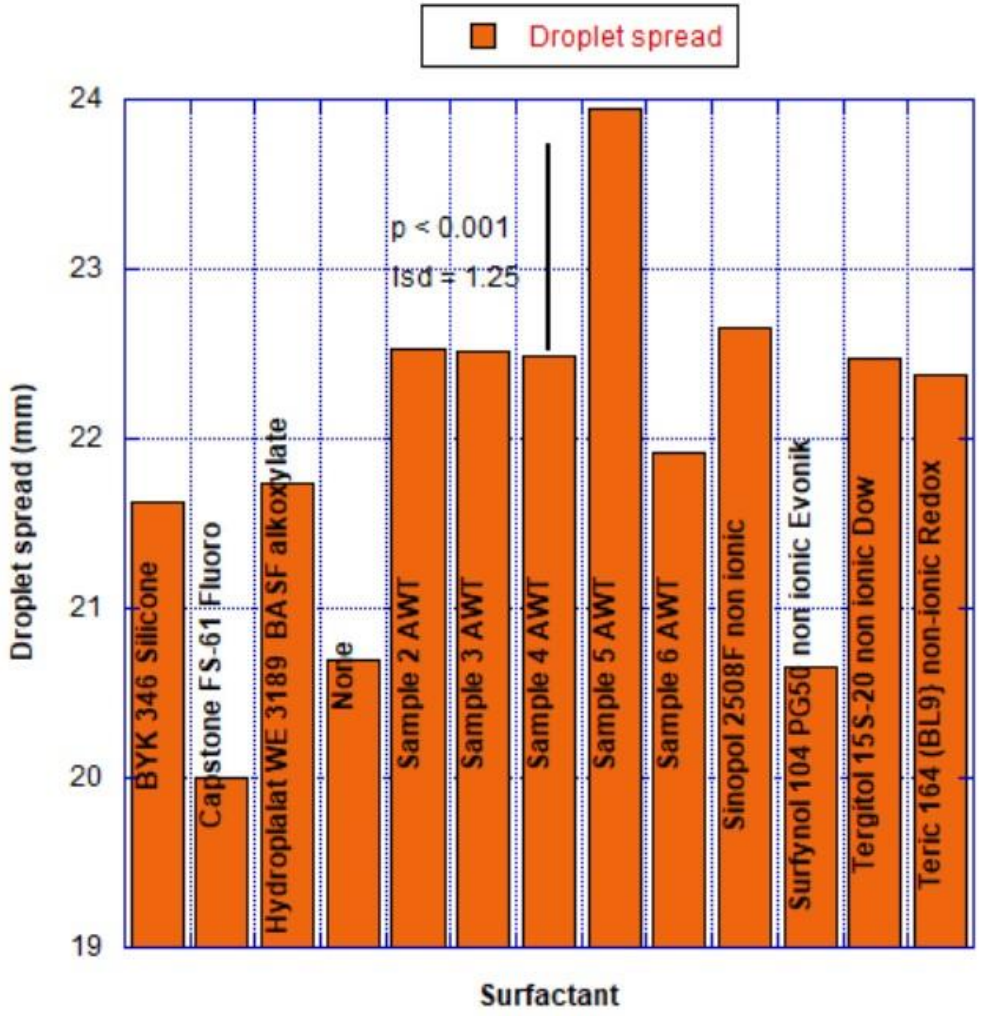
Surfactant Evaluation – Compatibility and Drop Test

Resin and Surfactant compatibility

Using Alkyd resins; (derived from polyols and a dicarboxylic acid or carboxylic acid anhydride.

Step	Method
1	Make mixture in a 100mL glass vial.
2	Add 1% of surfactant according to resin mass. For example 80g of resin will require 0.8g of surfactant.
3	Shake the glass vial for 10 shakes.
4	After 24hrs visual observation such as separation, change in colour, cloudiness/milkiness.
5	Clean black/white Leneta Chart with ethanol. Wipe excess.
6	Set dial of micropipette to 0.5mL.
7	Condition the micropipette.
8	The micropipette is held vertically, pre-wet the pipette tip by immersing into liquid, half way of the vessel.
9	Inaccuracy doubles when immersing the tip too deeply.
10	Inaccuracy increases three to five times by immersing too deeply while holding the pipette at a 30-40° angle.
11	Press the plunger button to allow water to aspirate and remove the pipette stright from vessel and dispense the liquid by pressing the plunger button a couple of times before testing.
12	Testing with micropipette.
13	Collect the liquid and slowly dispense onto the Leneta Chart. Press the plunger once. Do not dispense the rest of the liquid.
14	Measure the droplet spreading using Vernier caliper immediately.
15	Repeat 10 times.
16	Use Analysis of Variance (ANOVA) statistical analysis to analyse data.
17	The best Resin mixture should be further tested for contact angle using the Goniometer instrument.

Results: data pooled over all binders



Results by binder